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THE ARROW*

BY FRANK HAMILTON CUSHING

I

ITS ANTIQUITY

One of the most ancient of the things men have made is the arrow. There is no weapon the lineage of which can be unbrokenly traced further or to a simpler beginning. We have been apt to lose sight of this through associating as inseparable, alike in origin and use, the *bow* with the arrow. But I think it can be shown that the arrow had been perfected in well nigh all its parts, had attained rank as the chief weapon and one of the supremest possessions of man, and had given rise to a surprising variety of things and uses long ere the simplest bow had been conceived of or fashioned.

If this be true, then the arrow in its ancestral or embryonic form at least, was as old as either the stone axe or the shaped knife of flint, if not older; was, in fact, coeval with the knotted clubs and rough stones men picked up at need in the wilds they earliest traversed; and we can see that through javelin and dart and harpoon it was sprung from the spear and lance, as they from the fire-sharpened pike, and this from the mere pointed stick—made sharp not by art, but by use—for digging or hurling, by turns.

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* Vice-Presidential address before Section H of the American Association for the Advancement of Science, read at Springfield meeting, August 29, 1895.

II

ITS INFLUENCE

Again, there is no weapon and no single thing that for ages held sway so potent over the minds or the destinies of men, or wrought more varied influence over their institutions and customs than did the arrow; for I think I can also make clear the fact that as it was the chief reliance and resource of primitive man in the two main activities of his life, war and the chase, it speedily became his first, and ever remained, by representation at least, his highest, instrumentality for divining the fate or fortune its use so often decided, and in this way came to affect as no other single object of art ever did, the development and history of mankind in general the wide world over.

There is far more basis, then, than mere romance and beauty of comparison, for the poetic meaning of the arrow of literature, from Biblical and classic allusions, to Shakespeare's own. "Jove's thunder-bolts" or "Cupid's darts," "Diana's arrows" or the "shining shafts" of Apollo, or of "Death" and "Destiny," were real arrows to the men of old time, for to them the love pang was an actual wound from a random and puny childish shot. The sharp pain of mortal throe or the slow anguish of fleshly ill was from a veritable stroke of the cold, breath-sent shaft of ghostly foeman, or was the ceaseless rankling of some venomed barb of envious wizard or gaunt hungering demon.* The fire streak of the skies, the bright rays of the sun, the stinging flight of the sand-blast or hail-storm, and the sudden frost-bite—all of these were, indeed, to them the very counterparts and relatives of their own man-made but magically fashioned and feathered missiles. "Straight," "true," or "quick" as "an arrow," "sure as a shot," meant more to them than to us, for the force of such phrases never wore out so long as archers held their sway and men spake, like Homer's heroes, with "winged words."

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*Thus the Zuñi name for a swelling is sho'lina (from *sho'ole*, an arrow, and *i'na*, the content, the innermost element, quality, substance, or cause of a thing), and literally rendered means "arrow in it" or "arrow-caused." Thus, too, rheumatism is called by the Zuñis the "*sholiwe evil*" or "*disease of arrows*;" and in treating this malady their medicine men try, after due manipulation of the affected part, to pluck forth the misty arrows or barbs they suppose are within, with magical snare-wands of eagle-feathers, blowing lustily the while to cast out these poison-missiles and thus keep them from harming others or themselves.

III

ITS RELATION TO ANTHROPOLOGY

In presenting to you, then, a study of the arrow, I am not departing so far as might seem from the requirements of the high office you have so kindly called upon me to serve, for I would offer something characteristic, not so much of a field, as of a method and standpoint of investigation which I believe to be peculiarly adapted to the needs of our science; and I would illustrate, and hope I can measurably demonstrate herein, how special lines may and should be followed to general, and as far as can be, to universally applicable conclusions, these tendered not dogmatically, but suggestively; that we may select, say, single phases and arts of humanity and even local manifestations of them, and should not only present, but study them, subjectively rather than objectively; not externally and categorically or as isolated phenomena, or as mere examples of racial similarities and dissimilarities, nor yet, primarily, even as to whence they came ethnically, but rather, as to how and why they became at all, and originally,—as illustrations, that is, of the laws and principles which have governed man's development under all sorts of circumstances and in every age and land.

It is in this spirit, at least, that I treat of the arrow; not as a weapon merely, not descriptively to any greater than needful extent, but in its relation to the history of man and his culture-growth; as an illustration equal to any, I believe, of how certain few human things and activities have been born (often so simply as to have been inevitable wheresoever man chanced to dwell), and of how they have grown, also very naturally and independently of at least deliberate devising, and in so doing have sometimes given rise to multitudinous other and diverse things and activities, thus profoundly affecting man's psychological as well as racial development, and hence contributing inexorably both good and evil lessons and influences to his culture everywhere, and everywhere similarly.

If, moreover, I am at times seemingly too personal in style of statement, let it be remembered that well-nigh all anthropology is personal history; that even the things of past man were personal, like as never they are to ourselves now. They must, therefore, be both treated and worked at, not solely according to ordinary methods of procedure or rules of logic, or to any given canons of learning, but in a profoundly personal mood and way. If I would study any old, lost art, let us say, I must make myself the artisan of it—must, by examining its products, learn both to see and to feel as much as may be the conditions under which they were produced and the needs they supplied or satisfied; then, rigidly adhering to those conditions and constrained by their resources alone, as ignorantly and anxiously strive with my own hands to reproduce, not to imitate, these things as ever strove primitive man to produce them. I have virtually the same hands he had, the same physique, generally or fundamentally the same activial and mental functions too, that men had in ages gone by, no matter how remote. If, then, I dominate myself with their needs, surround myself with their material conditions, aim to do as they did, the chances are that I shall restore their acts and their arts, however lost or hidden; shall learn precisely as they learned, rediscovering what they discovered precisely as they discovered it. Thus may I reproduce an art in all its stages; see how it began, grew, developed into and affected other arts and things—all because, under the circumstances I limit myself to the like of,—it became and grew and differentiated in other days.

If the subject be in paths somewhat different from this, as, for example, some portions of my present essay are, I shall also think of it as it related to primitive men in primitive state of mind. I would divine how the men of old felt about their arrows, and what, therefore, they did to them and with them. They were simple, like little children, given to looking on their favorite things as the children of today look upon favorite toys, with a vast deal of personal feeling, emphasized in their case, to huge proportions, by the tremendous part these arrows bore in their lives. They had no knowledge of physics to guide them. Analogy was their explanation of relations, and the dramatic interpretation of these relations and the phenomena thereof their only logic, and so, behold, the arrow was for ages looked on as a wand of enchantment to those who made and used and lived by and loved it; was to them a symbol—a veritable portion and potency of the mightiest forces and beings that they thought the world and four quarters, the sky, or the under earth held; was thus transcendent over the skill of their deftest archer; was a thing of magic, and was willful, as like to obey the wind-bird with whose feathers they had winged its shaft withal, the god in whose breath it wavered, as to obey themselves or him who wrought and loosed it; for itself would decree his luck or his fate, not he who sped it, else why all so vainly at times, however great his skill or his effort, did he speed it? Therefore it played as large a part in their theoretical and mythical as in their practical life, and must be theoretically and imaginatively, no less than practically and experimentally, studied.

IV

MY DISCOVERY OF ARROW-MAKING

I tell you in detail, then, how, through making many arrows, I have studied the arrow and its development practically; how, by using it unweariedly and consorting long with those who used it actually with natural purpose and method, as well as by pondering deeply upon it in the most primitive moods I could muster, I have studied, theoretically, too, its meanings and relations; the place it held in men's hearts and minds ere ever they knew of goodlier friend or deadlier foe.

When I was a boy less than ten years of age, my father's hired man, while plowing one day, picked up and threw to me across the furrows a little blue flint arrow-point, saying: "The Indians made that; it is one of their arrow-heads." I took it up fearfully, wonderingly, in my hands. It was small, cold, shining, and sharp—perfect in shape. Nothing had ever aroused my interest so much. That little arrow-point decided the purpose and calling of my whole life. It predestined me, ladies and gentlemen, to the honor I have in addressing you here today, on Arrows; for I have studied archeology far more, alas, than anything else—ever since I treasured that small arrow blade on the lid of an old blue chest in my little bedroom, until the cover of that chest was overfilled with others like it and with relics of many another kind.

I was fortunate enough, not long after, to find in a neighboring field a place where some of these blades had been made. I could see that they had been fashioned in some way by chipping, for the scales lying there were like those I had been wont to strike off to see the sparks fly. When in course of time I had gathered a collection of some hundreds of relics from all over central and western New York, I began a series of experiments to learn how these arrows had been made. No one could tell me, and I had no books on subjects of anthropology then.

There was a farmer in our neighborhood who, when young, had gone to California. It was in the days of "Forty-nine," and he had been pricked in the shoulder by an Indian arrow. He may not have killed the Indian, but had, at any rate, his whole sheaf of arrows—quite as perfect a set as I ever saw. They were all pointed with obsidian tips, like mine in shape and finish, but smaller. In recognition of my passion he gave me two of them. I thought the points were of glass, and forthwith added all the thick pieces of bottle-glass and window-plate I could gather, to my store of raw material for practice. With this I worked, now and then, throughout a whole season, but the products of my hammerings, though fair, were but crude compared with those of the field.

When nearly fourteen years of age I discovered in the woods south of Medina, New York, an ancient Indian fort. I built a hut there, and used to go there and remain days at a time, digging for relics while the sun shone, and on rainy days or at night in the light of the camp-fire, studying by experiment how the more curious of them had been made and used. One evening I unearthed a beautiful harpoon of bone. I had a tooth-brush. I chopped the handle off and ground it down on a piece of sandstone to the shape of the harpoon blade, but could not grind the clean-cut barbs in its edge. I took my store of flint scales and set to work on it, using the flint flakes in my fingers, or clamping them between split sticks, saw-fashion. The flint cut the bone away as well as a knife of steel would have cut it, but left the work rough. Now, in trying to smooth this I made a discovery. No sooner had I begun to scrape the bone transversely to the edge of the flint than the bone began to cut the flint away, not jaggedly, as my hammer-stone would have chipped it, but in long, continuously narrow surface flakes wherever the edge was caught in the bone at a certain angle. I never finished that harpoon. I turned it about and used it as an arrow-flaker by tying it with my shoestring to a little rod of wood for a handle and pressing it at the proper angle to points on the flint which I wished to remove. I made arrow after arrow thus, in the joy of my new discovery, until my hands were blistered and lacerated, in one place so deeply that the scar remains to this day, and, worn down to a mere splinter, I still preserve my first tooth-brush flaking tool. (Fig. 1.)

I did not know at that time that archeologists the world over were ignorant, as I had been, of just how flint implements had been made, and I did not learn until my now so lamented friend, Professor Baird, called me to the Smithsonian Institution, in 1875, that I was the first man, or rather boy of our day who had practically discovered how to make implements of glass and flint flaked from side to side, and in this indistinguishable from those made by primitive peoples.

I have told this history as it occurred for a three-fold reason: first, to instance the manner in which I discovered flint-flaking, by chancing all ignorantly to follow precisely the course primitive men must have necessarily followed when and as soon as with the hardest and sharpest stone they could get, which was fractured flint, they tried to scrape and fashion bone or horn; and, secondly, to convey to you the lesson this boyish experience taught me; that I could learn more by strenuously experiencing with savage things and arts or their like than others or I could have learned by actually and merely seeing and questioning savages themselves about such things and arts. Long before I went to the Smithsonian or lived in Zuñi I had elaborated from the simple beginning I have chronicled here, some seven or eight totally distinct methods of working flint-like substances with Stone-age apparatus, and subsequently have found that all save two of those processes were absolutely similar to processes now known to have been sometime in vogue with one people or another of the ancient world, and I confidently look to finding that the other two, and yet additional methods since experimentally made out, were somewhere followed by men before me. And, thirdly, there is another lesson of later development this

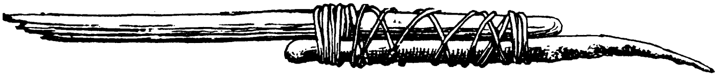

Fig. 1.—Experimental flint-chipper of bone.

experience has taught me: that paleolithic man, of the French caves at least—that man who is said to have known no other art of working stone than by rudely breaking it into shape by blows of other stones—could not have existed in such primary status of art for more than a few seasons at most; for even the casts of these cave remains that I have seen show carvings in bone and reindeer horn finished to such nicety and cut so elaborately that with the splendid true flint of Europe, experience in making any one of them would have given birth to the wit of making and applying a hundred flaking tools. As might be expected, therefore, I find among the casts of the French cave objects in our National Museum and in the University of Pennsylvania several fine and well-worn flint-pressers, a flaker or two, and reproductions of even one knapper of horn, and all these things are polished with art as of polished stone.

V

THE TYPICAL ARROW

Before I briefly relate and show how arrows of the ancient world were made I must need describe them, but not in all their variety and detail.

Those of the American Indian are, as a whole, fairly representative of all others, and to the student who would become familiar with the characteristics of nearly all classes of these I would recommend that most excellent and admirably illustrated " Essay on North American Bows, Arrows, and Quivers," written by Dr Otis T. Mason and published in the Smithsonian Report for 1893, to which I am myself so much indebted.

You are all familiar with the toy and target arrows of our time, but you may not be aware that all toys, wherever found, with the slight exception of but a few very modern and mongrel mechanical devices, are survivals of either the weapons and utensils or else of the religious paraphernalia of antecedent times, and that this familiar arrow of the archery clubs is no exception to the rule, but is an excellent representative in all essentials, save only for its blunted pile, of the arrow that won our preeminent place in the world—the arrow of the Norman Conquest, of Cressy, Poitiers, and Agincourt, of old England's matchless bowmen. But still it is not quite typical of its prehistoric kind.

The arrows of the Age of Stone may be best represented, I think, by one of their most highly developed forms—that of the famous Cliff-dwellers of the southwestern cañons, for in this we find combined the features of nearly all other kinds. In that matchless collection of very ancient remains from the cliffs gathered by the Wetherell Brothers and the Jay Smith expedition and now owned by Colonel C. D. Hazzard, of Minneapolis, which is on exhibition, I am happy to say, in the Museum of the University of Pennsylvania, are many specimens of this arrow (Fig. 2). They are from thirty inches to nearly a yard in length; are tipped with delicately flaked, diminutive points or piles of chalcedony or obsidian. Some are barbed and tanged; others are merely triangular; but each is set into a nock or deep notch at the point of a tapering, hard-wood fore-shaft, and firmly attached thereto by alternate cross-wrappings of sinew. The fore-shafts are about half as long as the shafts or steles, which consist of medium-size reeds or canes, and are fitted with shoulders and thence tapered sufficiently to be let into these slightly smaller ends three or four inches—far enough to rest against the stop or septum of the first joint—and are held in place by a seizing or binding of sinew around the shafts at the points of insertion.

The steles or bodies of these cane rear-shafts are some of them grooved with long, straight, or wavering lines, and are not only winged at the shaftments or base ends with feathers, but are also footed—that is, the extremities have been split slightly at four, sometimes only three, equidistant points, and plugs of wood have been set into them and bound in place by sinew to receive the nock for the bowstring, somewhat as strips of hard wood are let into slots of our spruce target arrows to keep them from split-

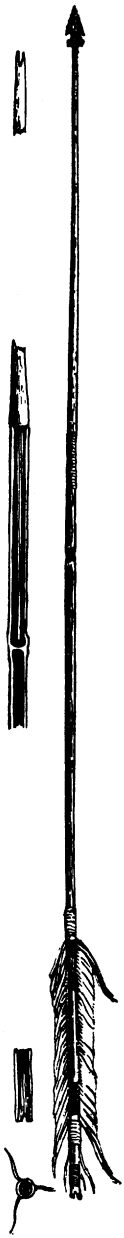

Fig. 2.—Foreshafted reed arrow of ancient Cliff-dwellers, showing tip, foreshaft, and footing-plug insertions.

ting when drawn or loosed. Each of these arrows is winged with three half-plumes, mostly split from the first six pinion feathers of eagles or falcons (for they happen, with one or two exceptions, to be war arrows), which are laid equidistantly along the shaftment the length of one's palm and forefinger down to within an inch, more or less, of the footing, and seized at the ends with sinew and glue. One of the plumes of each arrow, called the "tail" by the Indians and the "cock feather" by the old English archers, was placed so as to stand out exactly at right angles with the nock of the arrow, and, as I shall presently show, was most significantly tufted and notched, primarily to denote that it was to be uppermost when the arrow was nocked, so that neither of the opposite feathers or "wings" should touch the bow when the arrow was loosed from the string.

Finally, around the shaftment, between the feather-seizings, bands or ribands of color were painted, red and black, chiefly, and variously disposed, also most significantly, as we shall soon see. Arrows of the kind I have just described are called "compound." Arrows with shafts made from single rods of wood are called "self" arrows, and, strangely enough, although apparently simple, they more often than not have tokens of derivation from the compound kind, and the successful making of them was much more difficult.

VI

THE MAKING OF ARROWS

As shown by my experiments of many years, by the scattering allusions of travelers, and, more than all, by my life with an archaic, very archaic, people, the steps in the manufacture of arrows, of their points of flinty stone, which men of primitive days most widely followed, were few and simple, yet exceedingly curious and ingenious.

They first sought the material, mined it arduously from buried ledges with fire, mauls, and skids,* or, preferably, when the country afforded, sought it in banks of bowlder-pebbles, digging such as were fit freshly from the soil, if possible, and at once blocking out from them blanks for their blades by splitting the pebbles into suitable spalls, not by free-handed percussion, but by holding them edgewise on a hard base and hitting them sharply and almost directly on the peripheries, but with a one-sided twist or turn of the maul or battering stone. With each deft stroke (Fig. 3) the spalls, sometimes twenty from a single cobble or block of moderate size, were with almost incredible rapidity trimmed to the leaf-shape basis of all primitive chipped tools by knapping them with a horn, bone, or very soft, tough, granular stone hammer mounted in a light handle. For this the spall was placed flatwise on the knee or on a padded hammer-stone, so called, and held down by the base of the thumb of one hand (Fig. 4) and rapidly struck along the edge transversely and obliquely to its axis lengthwise, with the outwardly twisting kind of blows used in the splitting. The blanks thus formed were then carried home for leisurely or opportune finishing, and carefully buried in damp soil, not to hide them, as has been usually supposed, but to keep them even-tempered or uniformly saturated (" full of sap and life, ' these ancients thought), whence the so-called " caches " of numerous leaf-shape blades which are now and then found, for example, throughout old Indian ranges.

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* The reader is referred to the various masterly essays on this subject by Mr. Wm. H. Holmes and one by Mr H. C. Mercer, published in former issues of this magazine.

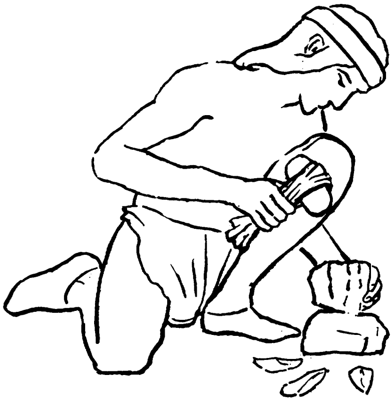

FIG. 3.—Splitting spalls or flakes from mass for blade-blanks.

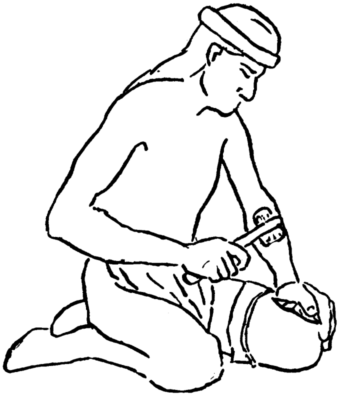

FIG. 4.—Knapping or shaping blade-blank from spall.

In finally forming arrow-points from these trimmed blanks, the smallest of them only were chosen. The first care in fashioning one of these was to remove protuberant points from its edge and sides and to thin it down by means of a pitching-tool of buck-horn. This was effected in several ways, usually by clamping it in a folded pad of buckskin under the knee against a hammer-stone or notched wooden block, so that the projecting edge rested over the margin or else over the pit of the stone, or notch if a block or log were used, and with one hand holding the point of the pitching-tool very lightly and slantingly and at a wide angle, against or just over the points to be chipped, sharply tapping the tool with a maul or with a knapping hammer (Fig. 5). Thus the blade was quickly thinned down and made almost even-edged. It was now further shaped, sharpened, nocked, or barbed or serrated, according to intended use, and tanged, with a rounded, flat bodkin of horn (seized to a stick or handle for leverage at one end and tapering therefrom to a curved, blunt point), either by laying it on folded buck-skin, over the hollow of a hammer-stone (Fig. 6) or the palm of the left hand, pressing it downwardly along the edges at nearly right angles, and always slantingly to its length, or else by holding it edge up between the thumb and all the fingers of the left hand and freely flaking it, with the rod held in the right hand (Fig. 7), with handle braced against the ribs for steadying, by pressing the sharp edges until they caught in the point or blade of the bodkin, and twistingly wrenching them off by a most dextrous motion, which I can exhibit, but not adequately describe or illustrate.

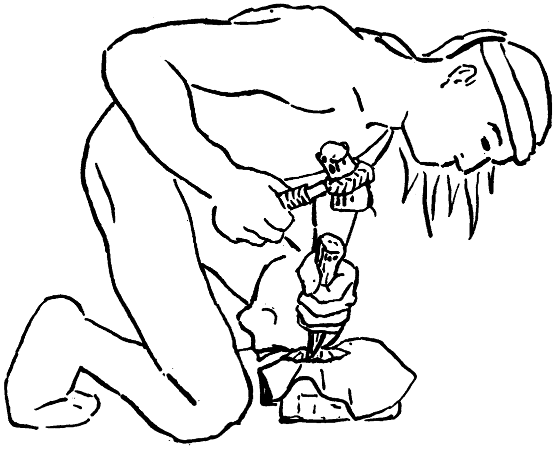

Fig. 5.—Pitching or trimming blade.

All this sounds complicated and tedious, but I have succeeded from the time I found a suitable pebble of fine-grained, ringing, cold and fresh quartzite, in making seven finished knife and arrow blades in exactly thirty-eight minutes, and I have often made from obsidian or glass a very small and delicate arrow-point—the most easily made, by the way—in less than two minutes.

When a number of the points had been finished they were warmed by the fire and rather ceremoniously enwrapped in buckskin or fur, not more to keep them safe than to "cure" them of all this rough handling and win them to favor and strength, for by the very clink of the perfect ones it was known now that they were full of life, each of its own—the life and fire of the lightning, which could be seen at night when they were rubbed or struck against one another or ground on a sharpening stone.

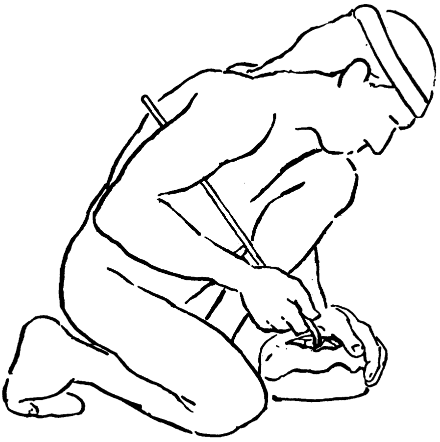

Fig. 6.—Chipping by downward pressure.

When war work was impending these old-time artisans or fletchers went forth "sprout making and cane-cutting," as they called their gathering of reeds and twigs; or when later, as the Pueblos did, they abandoned the compound arrows of their ancestry and took to horse and short bows, they called it "cane-sprouting" when they gathered, all green, their shaft twigs, or "browsing" when they designed them to serve for the chase. These twigs were cut with due sacrifice to the wood sprites, were brought in head or upper ends fore-

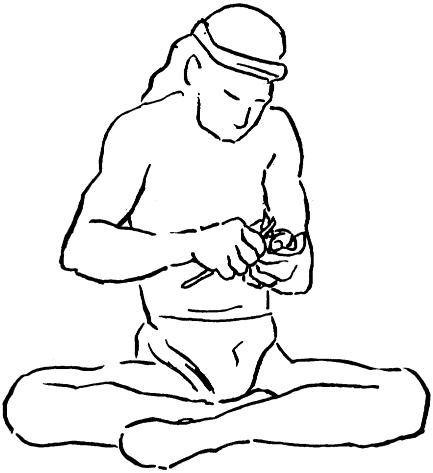

Fig. 7.—Chipping and nocking by cross pressure or wrenching.

most, passed over the store of points to make them acquainted, and laid down with their tip ends to the east or south if for the peaceful hunt, to the west or north if for war. They were peeled upwardly, or from butt to tip, that their way of working be not balked; scraped and shaved to uniformity, also from the butt upwards, and placed alongside a hot fire or buried in moist, hot sand to soften or "ripen" them; and then, after being bitten straight in the most crooked places (Fig. 8)—it did not much matter how crooked they were at first—each in turn was clamped between one nether, grooved piece of sandstone or sanded wood and one small flat piece held over it firmly in the left hand, and was shoved and pulled twistingly back and forth until smoothed and rounded and further straightened (Fig. 9). Finally, each was both seasoned and polished, then straightened to a nicety by passing it, under heavy pressure, over a smooth grooved piece of very hot soapstone, or else, better still, by heating it and "stretching" it through a veritable drawplate of bone, horn, or hard wood (Fig. 10) furnished with a single medium hole or with several beveled perforations. While being stretched the shaft was wrenched with a quick turn here and there at remaining crooked places, then smoothed

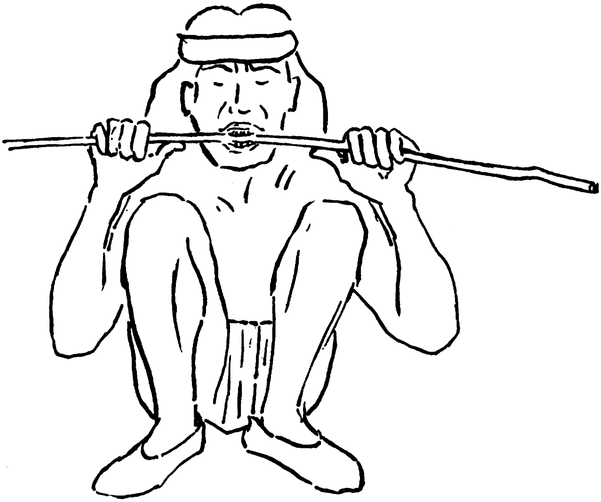

FIG. 8.—Shaft-biting for preliminary straightening.

down by additional and gentler stretching, that it might be coaxed to keep straight. When fully stretched, it was grooved along three or sometimes four places on its circumference with the tusk of a puma or wild cat (of fiery eye) if for war, with elk, beaver, or other gentler kind of tooth if for the peaceful chase. With the point of this tooth the shaft was pressed alongside of the stretching plate as it was being finally pushed through from tip to shaftment place (Fig. 11) or feathering point—twistingly for at least every alternate groove—that a wavering trail might be made for the lightning to traverse from point to quill when the feathers whistled, speeding the sure flight of the arrow.

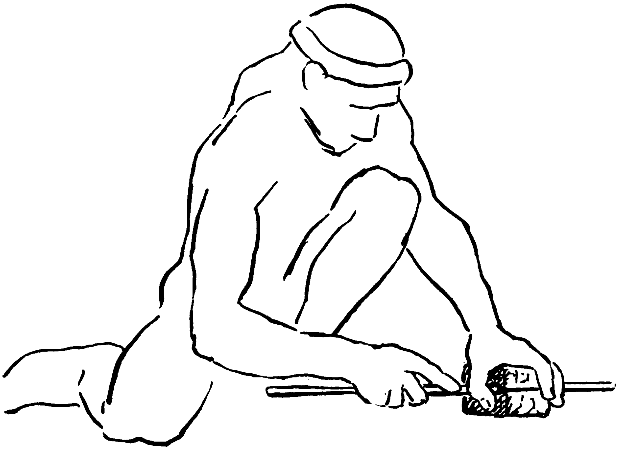

FIG. 9.—Shaft smoothing by grinding.

The shaft came forth from this operation lengthened considerably, polished, groove-marked, straight in the main, but bent perhaps along its full length. If so, it was warmed along the inner curve of the bend, held, tip outward, in the left hand, the butt grasped by the right (Fig. 12), and was bent a little this way and that till true, held so a moment, and laid down close to the fire, where it speedily dried to rigid straightness, until perchance rained on. The shaft was nocked at the lower end first by notching it deeply with a flint sawed across (but more or less with) the grain and by rasping out the bottom of the notch with a blunter-edge knife or sanded string and by heating, and spreading the flanges thus formed with a rib or other hard edge or with a hot stone. If a split appeared or was likely to appear, the foot was whipped with sinew.

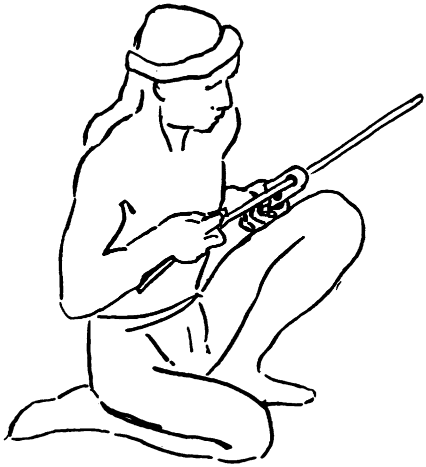

Fig. 10.—Shaft "stretching" or final straightening with draw plate.

Now it was ready for feathering. Three pinion feathers, all from the right or all from the left wing of eagle, hawk, or turkey were chosen and cleft from tip to base by splitting and pressing the quill apart along its inner groove or mid rib. The featherings were all chosen from corresponding sides of the mid rib, that they might be uniform. The pith was scraped out of the lower parts of the quills until they were thin and flexible, and the edges of them were pared away. They were now laid flat along the shaftment, the bases of the quills toward the tip, first the right-wing quill, then the left-wing quill, so called; finally the tail quill; the latter transversely to the nock to serve as a cock feather.

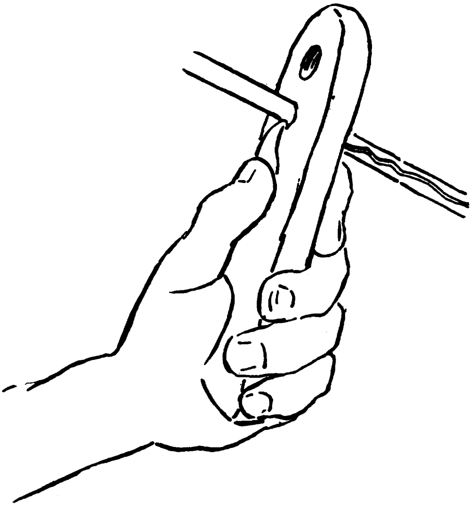

Fig. 11.—Shaft grooving with tooth and draw plate.

All were seized on with filaments of mouth-moistened sinew, one end held in the teeth until a turn or two of the wrappings had been taken to keep the feathers in place. Then one end of the shaft was held under the left arm, the other between the thumb and forefinger of the left hand (Fig. 12 a b, *a*). The thumb and the fore and middle fingers of the right hand were moistened, and with them the shaftment grasped over the first wrapping. The sinew filament was drawn taut and held so between the middle, little, and ring fingers and the edge of the palm, and the shaft rapidly twirled with the thumb and fingers of the left hand (Fig. 12 a b, *b*). Thus the bindings of sinew were pressed flatly and tightly on as it was wrapped, and, being moistened and very fine at the ends, adhered without further fastening.

Now the lower ends of the featherings were similarly fastened, some of the pluming or alæ being usually seized on together with the quill to strengthen and tuft it, and the plumes being stripped down once or twice spirally with a double motion to make them lie flat, were finally pulled through at the ends to straighten them, and flatten them still more.

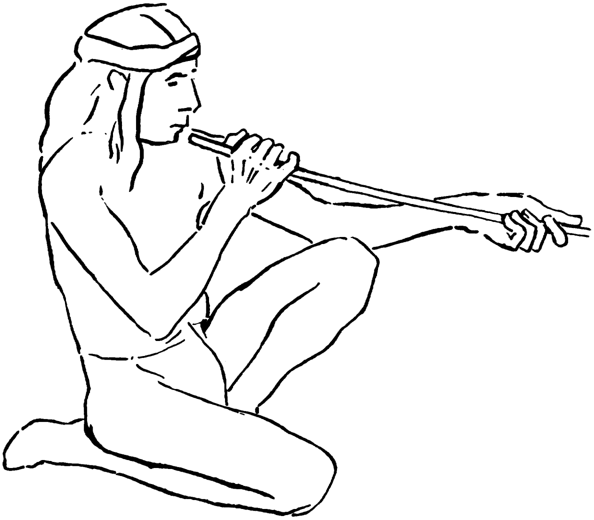

Fig. 12.—Shaft-truing.

After all the shafts had thus been feathered the whole bunch was taken in hand, the butts struck against the ground or a stone, then reversed and righted, and with a puff of the breath thrown down, ends forward. According as the arrows rebounded and fell, they were carefully sorted into groups, and with the more highly developed tribes, like the Zuñi, the cock or tail feathers of each group were notched, trimmed, and tufted differently from those of the other groups, to denote their classes as being, one set of the north, another of the east, and the others, respectively, of the south and west. The top- and mid-most shaft was reserved as a personal arrow for special treatment, and the doubtful shafts were left unfinished. At last, in correspondence to the

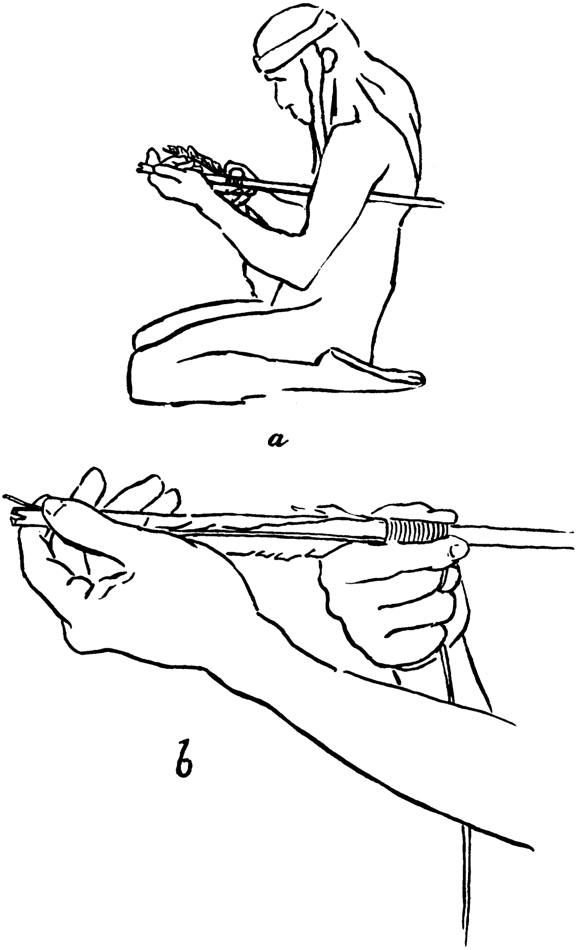

Fig. 12 a b.—Feathering and seizing; *a*, position in holding; *b*, of fingers in twirling and binding.

kinds of shafts as indicated by the cock feathers, the points were selected, the keenest and deadliest for the north and the west, the broadest and shortest for the south and the east. The tips of the shafts were nocked and rasped, each with the base of the point designed for it; and the points were then seized on free-handedly with sinew, as I have described heretofore. All these increasingly solemn operations were concluded by the orderly ribanding of the shaftments with the colors of death and blood—black and red,—or with the yellow of magic, or the green or blue, of life and victory.

The arrows were finally laid out to the west or the east and breath-endowed with lives of their own; then placed with their parent, the fire arrow* (all save its consort, the personal one), in their quiver, heads downward, feathers upward, that the lightning run not out nor the feathers speak before their time, but sleep till wakened for war council and "feeding" or medication.

I find evidence that the Cliff-dwellers followed much these same methods, save that the fore-shafts were made differently, and the order of proceedings, as evidenced dingily by traces on these old-time shafts, inspected in old-time mood, was accordingly different.

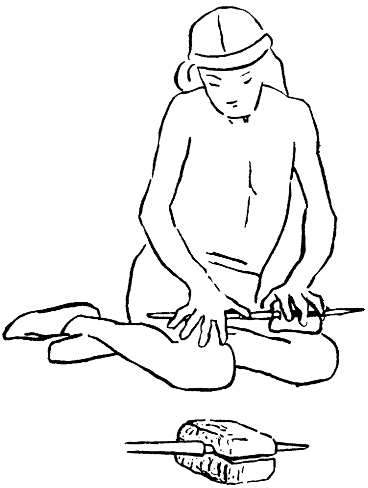
FIG. 13.—Turning or chamfering of fore-shaft.

The fore-shafts were, for instance, tapered and rounded, chamfered, and the shoulders cut on them all by twirling (either with the fingers or with the hand on the thigh) between gritty stones (Fig. 13)—as early a kind of lathe-work as I have learned of, this! Moreover, before the cane-shafts were grouped to the four quarters and the points chosen for them, the tips were fastened to the fore-shafts, as belonging to them,—being their shanks. This and many other interesting, highly significant details, I have made out; how, I cannot pause to relate, but with Zuñi lore and language, as well as reason, on my side.

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* This was not always an arrow, properly, but a shaft carried ever ready for use as a fire-stick or drill, in the quiver. It was usually, however, made from a well-tried arrow, and was called fire-reed or arrow, by the Zuñi. I am assured by that distinguished Arabic scholar, Dr Talcott Williams, of Philadelphia, that such must have formerly been the practice of the Arabs, for he finds that their terms for arrow and fire-stick are likewise similar.

Nor is there time for analyzing all of these customs and explaining how many of them are survivals of originations so practical and simple withal that they must have been measurably similar and universal in given conditions of culture-growth; but it may be well for me to explain that, being survivals of ages and successions of experience, we must eliminate one after another, the more elaborate of them as we think backward in time; that we must do the same with the working processes I have been earlier describing also; and if you will bear with me during a few moments more of detailing, I will try thus to lay bare not all the stages in stone-working and arrow development, but what seem to me to have been their primal beginnings.

VII

ORIGIN OF EARLY ART AND OF LANCE-FORM TOOLS

In a series of lectures given last spring at the Drexel Institute of Philadelphia, and in other papers, I have brought forward some of the many reasons which have induced me to suppose that man began his art development—his really manual and therefore mental and human development—on the coast of the sea of some tropical or temperate Old-world land. I cannot enter into the matter here much farther than to state that this human ancestor could not well have developed the habit of erect walking until forced from his earliest arboreal habitat and compelled to fend for life with his own hands, and thus taught to use them more for seizing and doing than for climbing and merely clutching, and thus also taught by his hands to devise, and with them to devise purposefully.

Now, in this period of transition from forest to open, from a condition all but as artless as that of the higher tree-dwelling Quadrumana to a condition demanding rudimentary art at least, man could not have subsisted, it seems to me, in any other environment away from his fruit-giving trees, than near to the foodteeming sea, which, in dry season and wet, in cold and in warmth, ever abounded in easily taken creatures and things edible. The universal craving or liking man has for salt—especially with his meat food—would seem to point to some such profound and primal experience-period of the race as that. The well-nigh universal association of the sea-shell with fire ceremonials, would indicate that thus, too, on the coast of the sea he first learned to fear fire little enough to capture and keep or carry in shells, its seed or young; to loose and feed them, for protection at night, and from cold, and thus also to use them—the all-devourers—for half eating for him, food else too tough, too cold, or otherwise too hurtful for his eating. And, finally, the universal distribution of our kind coastwise, it would seem, the whole world over, ere ever language even had been developed vocally from hand usage and gesticulation far enough to remain steadfast or undifferentiated structurally in every great continental area, would also, along with much evidence of the arts, not least of them the arrow arts, still more strongly evidence the same sort of thing.

We can readily enough conceive that it was on the old ocean shore man learned to crack food things—shell-fish and bones—against the convenient stones of the beach; then to crack them with stones, and thus to crack stones against other stones in order to make them in turn crack these food-things the better, and at last to crack such cracking-stones with other stones, wherein he became a tool-making creature—that is, used tools with which to make other tools or with which to imitate and better mere use-made tools; and this was, and here ended, his *true* paleolithic period.

It was there, too, in the soft sand or mud of the seashore, that we most naturally think he learned to dig (for shell-fish and the like) with sticks, wearing them sharp thereby, and thus learning also to wear them sharp intentionally, in order to make them sharp; and from prodding the sand away from his food, it was but a step for him to prod his fellows—or anything else that stood in the way of his food—and thus-wise would begin the development of the pike, the lance, and the spear; the harpoon, the dart, and the arrow. The seeming likelihood of all this would lead me to linger yet a little longer by the seashore with my earliest man. Moreover, I think I can thus explain better than elsewise quite other things about the arrow than merely its beginning, and can perhaps make it evident that I am not so fanciful as would seem, in this speculation.

First, as to the stages of tool and weapon making, there are three examples of the way in which awkward-handed, experienceless-minded beings began making (or, rather, using) things as tools. They are to be found in the acts of monkeys, imbeciles, or very young children. I have watched and experimented with all three studiously and long. If they would break a thing, they cannot—or at least they never do—dissociate the thing to be broken from the breaking of it. They hit it against something bigger. My friend, Thomas Eakins, the scientist-artist, of Philadelphia, has a pet monkey named Bobby. As Mr Eakins is honoring me by painting my portrait, I have had opportunities for observing Bobby. Now, if you give Bobby a large, hard nut that teeth will not crack, he instantly looks about for a stone or other hard object (he one day chose—literally hit upon—my head) and proceeds to maul the nut against it until broken. Although his master has surrounded him with convenient stones and sticks, he never uses them against the nut, but ever the nut against them, and if his curiosity be aroused as to any one of the nut-like stones, he hammers belike this stone against another, until it—not the stone he hammers—is broken, or if accidentally he breaks the stone he is hammering upon, he gains no lesson therefrom, but promptly seeks another stone on which to hammer the one he would break.

Very little children, if untaught or non-observant, do things in this way, and as far developed as the Tasmanians were above this stage of art, they still practiced edging their hard pebble-choppers (Fig. 14) by seizing them with both hands—the more accurately to direct them—and whacking them until chipped sharp obliquely against other stones, and in this they were, but a few generations ago, in the true paleolithic period of their development.

There are also three contemporary examples of the early use of a prod as a weapon—of at least the chase. These are: Bobby again, young children, and (I say it not gracelessly) women trying to drive chickens or cattle or other frightful creatures. Bobby hates a certain too curious cat, and is not sufficiently scared by her to fear showing fight whenever she appears.

If the cat happens to steal near, but keeps beyond the reach of his tether, he does not throw a stone at her; but he has a long stick with which he hauls things toward him when put beyond his reach and with which he scratches them up when they are buried nearby. While it never occurs to him that he can reach the cat with a stone by hurling it at her, yet he tries to reach her with the stick by lunging it at her. He has thus learned that if he cannot punch her in this way, nevertheless he can hit her, and educe the desired and delightsome squall by lungingly hurling it at her, and he does this now with increasing skill and frequency; never by actually throwing it, but by lurching it forward with both hands, and as much with the body as with the hands and arms. If you ever see awkward women or children after anything with a "sharp stick" you will observe that they throw it, if they cannot catch up, in much the same fashion—lurchingly, not overhand, as a spear should be thrown, for that would discontinue the initial movement.

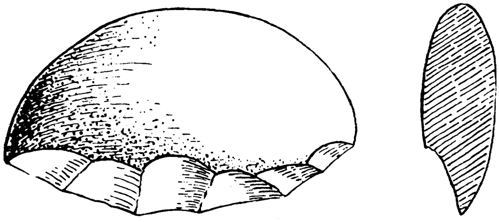
FIG. 14.—Outline and section of Tasmanian chopper-pebble.

And now, I will trace the arrow up from this lowly and slow-paced infancy, to his manhood and marriage with the home-staying bow, for whom he has ever since so swiftly obeyed and run errands.

VIII

DEVELOPMENT OF ARROW-FORM MISSILES

From such breaking of shells, stones, and bones such as I have characterized, and much cutting of his fingers thereby, primal man must have learned speedily enough to do all sorts of cutting, scraping, and scratching with the sharp fragments thus produced. For long, however, he probably used these fragments unmounted, grasping them, perchance, with wads of seaweed or grass, or, when large, winding or clasping them in wisps of fiber or rolls of integument for holding, as I have grasped the stone here exhibited (Fig. 15), with a fold or two of buckskin, in making with it the shaft-polishers and other like tools I have needed to use in my recent experiments for these demonstrations.

But by lodging such blades in wood or often wedging sharp things into the end of his pike-form digging stick, he must have learned in time that the stick, so long as thus armed, dug better (and cut his contestants or his prey better, too) than ever merely with its wooden tip, no matter how well seasoned by heat or favored by long-tried use this was. Then he tied or otherwise attached suitable chips to his digger, which he may have sharpened in the old way—at the other end (Fig. 16)—as the Tasmanians used to, but which we may imagine he now shortened—having more of use for its peaceful than for its offensive purposes*—until, at need for the capture or the fight, he got a reed from the seaside rivers or marshes, straight and long and light enough to punch withal or fling, if it but had a point, and mounted his stone-bladed picker in one of its hollow ends, thus again lengthening it, at will. Lo! the fore-shafted spear, twin-changeling of the shaft-handled dirk and knife! Thus was born, with many another first form of the things we use, the ancestor

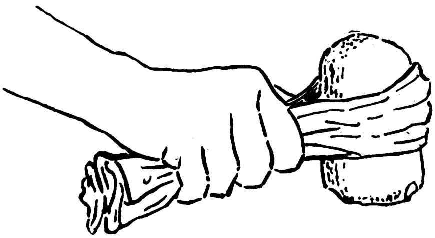

Fig. 15.—Makeshift haft of hammerstone.

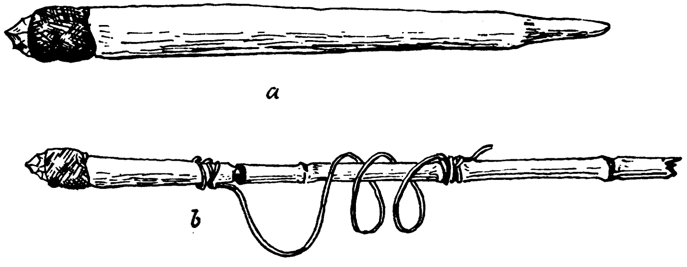

Fig. 16.—*a*, Tasmanian knife-pointed digging stick; *b*, mounted in reed shaft as spear.

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*The digging-sticks of the Australian women (of the interior) were, unless tipped with stone, often six or seven feet long, and were used not only as implements, but also as weapons, either as quarter-staffs, sidewise; or as pikes or headless lances, endwise.

alike of the retrieving arrow and of our familiar pocket companion—pencil and wit-sharpener of those who write—long bebefore man was weaned from the skirts of his Gray Old Nurse, the sea—born there, in time to drift with him, ere yet he left her side, over the whole shore-land world.

We have but to note the long and tapering forms of prehistoric stone knife-handles everywhere pointed—not quite usefully otherwise than as survivals of an early use—to believe in this thought as not improbable. Then, too, we may note the unearthed knives and harpoon-heads of the early coast- and island-dwellers of California, or of the ancient fisher-folk of Peru and Chili (Fig. 17), to see that each is so like the other as to puzzle the sharpest observer. The handle of each, though preserving its ridges at either end, alike useful for grip-guard or reed-shoulder or tying (*b*), may not denote that each was used at so late a time indifferently for either purpose, but it seems to say that its ancestor was so used for very long. When, some time early, man found that the slim-handle knife, getting loose in the shaft of his spear, pulled out with the fish he had struck, but that if tied with a long enough string held its prey quite as well as the whole spear when held by a string in his hand, he had but to transfer his retrieving line, which always had hindered the fling, from hand-hold to mid of the shaft, and from thence to the hilt of the head, to have formed a perfect harpoon. (Fig. 18.)

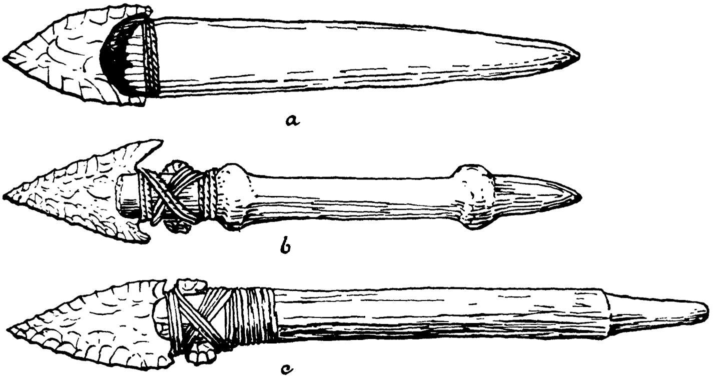


FIG. 17.—Knife-harpoon heads; *a*, California; *b*, Peru; *c*, Cliff-dweller.

Imagine how men in those old days thought of the sharpbeaked shafts they cast at fishes and water fowl! They must have longed every day to emulate the osprey and the fish-hawk! But although they made their harpoons hook-beaked with barbs (or had made them so already) and claw-headed with recurved bone prongs, yet their flights of them were none the better for all that! Then why not tie hawk feather or eagle plume to the body of the missile? How such feathers flew and flew, whether with the bird they belonged to, or when dropped in the wind! Forthwith, you may be sure, they tied wing feathers to their shafts, two at first, midway; but lower down after awhile, and with a third feather, the "tail," for the smaller shafts, to keep them straight and headwise. Primitive man never, until after the time of Homer, got over this believing (as his kind believe today), that the flying quality of the feather and of the bird it came from gave light swiftness and sharp sureness to his bird-bolts, not the feathering in itself.

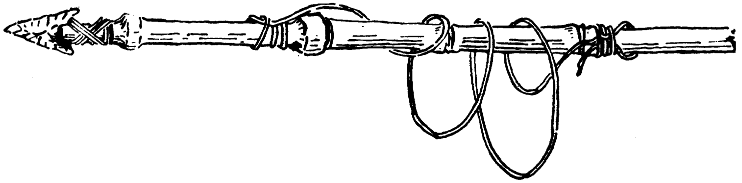


Fig. 18.—Knife-headed harpoon.

IX

ORIGIN OF THE DART-FLINGER AND BOW

Using spears and harpoons with irregular poles, or shafts of jointed cane, man found a mighty advantage in those which had knobs or joints large enough to afford sure grasp to the hand in throwing, especially men of the water side, where their things were so often wet and slippery; and still greater advantage they gained from this experience later, when with plaited girdles or bands of other sort

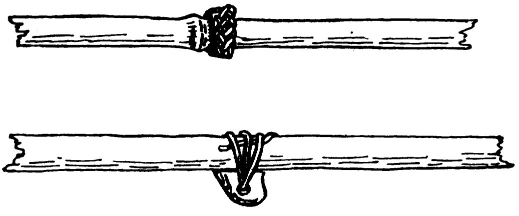


Fig. 19.—Shaft-girdle and clutching-knob.

they enlarged these joints at the grasping point or bound to the shafts, knobs or catches, of ever better and better device for the special work in hand (Fig. 19). They found, too, that for far throwing and small quarry the light javelin was best, and that he who had the longest arm could hurl it the farthest; he who had the strongest fingers and could launch his missiles with one or another of them used as a lever behind, like a hook against or inside of its hollow butt (Fig. 20), was surest of aim and sharpest of stroke.

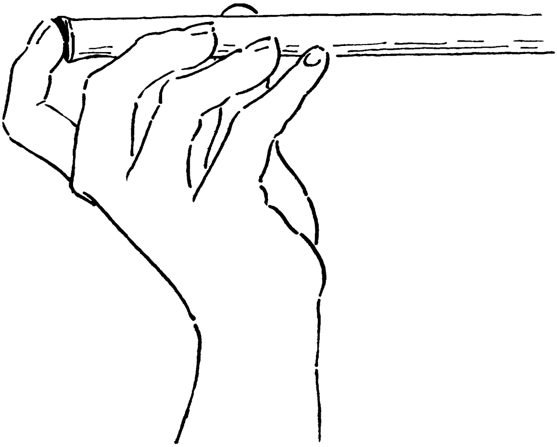


FIG. 20.—Finger-throw.

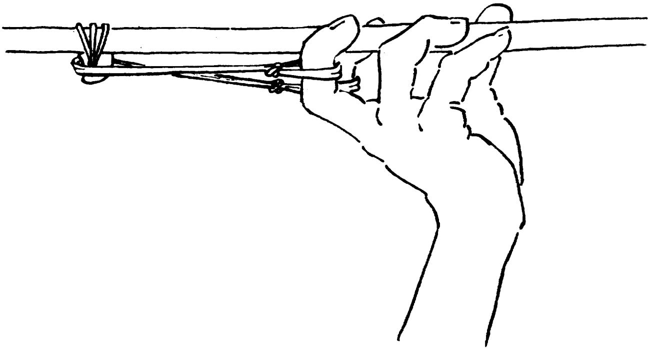
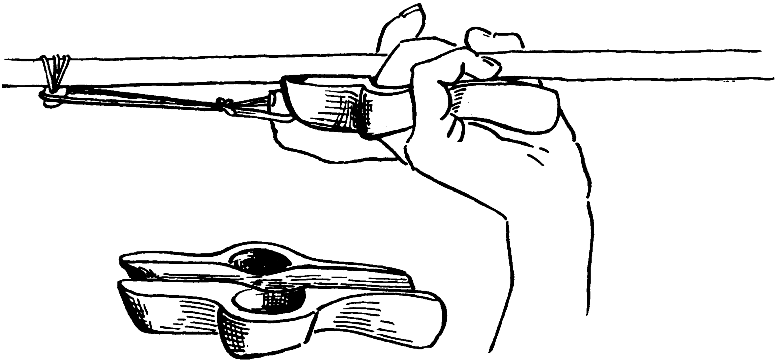


FIG. 21.—Spear-noose or slinging strap throw.

So presently they began to fit the shafts with straps or their fingers with slinging-nooses (Fig. 21) to farther the flight. From the soreness which came of much or constant use of such first appliances (I have tried them and know), it was needful to make them ever better and better, until the loops became rings for the fingers, more rigid, and joined together; and these, in turn, became palms of rawhide for the throwing-hands, or of wood hollowed straightly and fitted with holes at the sides for the thumb and great finger, and with a groove underneath extending to the rear end, at which was a notch or a hole for this finger when stretched back along the groove and thrust up through the hole or over the notch to hold the noose of the sling-strap (Fig. 22) or press against the shaft-butt, so as to project with force the spear when, if long, it was thrown with both hands.



Figs. 22, 23.—Spear-palm and slinging strap.

Of such early devices as these spear-palms or graspers, so to call them, I have happily been able to find two historical examples, and doubt not others will yet be found. One of these, although a true spear-thrower, is quite such a palm as I have described, save only that it is a little too long and is furnished with a rude catch of bone in place, as it were, of the fore-finger-nail. It was rescued from the Santa Barbara Indians, ere they became extinct, by that great voyager Vancouver.* There was found, too, some years ago, another of these things, even more archaic, a veritable spear-palm, such as I have described, but beautifully inlaid with bits of haliotis shell. I saw it in a collection of remains from the islands of the same region, but did not know, and no one at the time knew, what it was. I have now, however, identified it and reproduced a plain one like it (Fig. 23) and used it successfully. Perhaps the most interesting historic relics showing survival, I believe, of such uses of the spear-palm device as are here referred to are to be found in collections of Etruscan and early Roman remains.

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*This specimen has been discribed in the Journal of the Anthropological Institute of Great Britain, vol. xxi, London, 1891, by Mr Charles H. Reed, of the British Museum; and both rediscribed and figured by Professor Mason in his little paper on "Throwing-sticks from Mexico and California," published in the proceedings of the National Museum, vol. xvi, No. 932.

At the Washington meeting of this Association, as may be remembered by some, my friend, that brilliant and many-sided naturalist, Professor Edward S. Morse (who did more for the study of "arrows" as a subject than any one previously, in his striking and oft-quoted work on "Arrow Release"), held up before our section and discussed some of these remarkable little bronze relics, telling us that they were called "bow-stretchers" or "bow-stringers," ordinarily, in European museums; that, however, antiquarians were not satisfied, nor was he, that they were such, and that all sorts of opinions, equally inconclusive, had been advanced as to their possible use. He then, seeing me, handed the specimen to me, remarking very kindly that "if any one could make out their meaning, Cushing could." Although then I was dubious, today I am grateful for both the compliment and the opportunity; for, comparing this old Etruscan relic with such a double spear-ring or clutch or such a spear-palm as I have described (Figs. 24, 25), one sees that the spikes or prongs

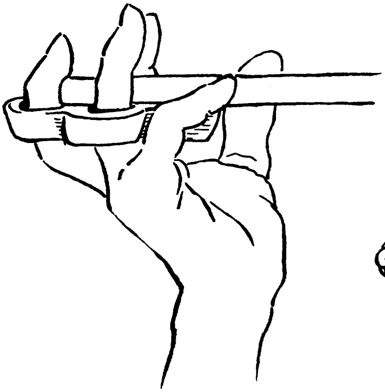

Fig. 24.—Finger position in spear-palm clutch.

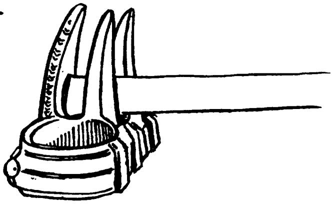

Fig. 25.—Etruscan "bow-stretcher;" probably spear-clutch.

on it so resemble the fingers when thrust up through the holes of a spear-palm like the Santa Barbara restoration, that they seem to have been made to replace them, as if to receive a spike at the butt of the spear, and thus enable the warrior to reserve the strength of his whole grasping hand for gripping and bracing the spear in close work or in projecting it far and with force when he would hurl it at the breast of the foe (Fig. 26). With this in mind, one sees, too, on re-examining the specimen, how the rings fit the fingers exactly for such use, and how they, and the prongs also, show wear only inside, where they should be worn if used as I have supposed. Finally, in the ornaments of the particular specimens I have examined, one can see plain survival of the double-bent bands, the knotted fastenings of rawhide, and the prongs, of horn or bone, with which like spear-clutchers might have been made long before the age of bronze.*

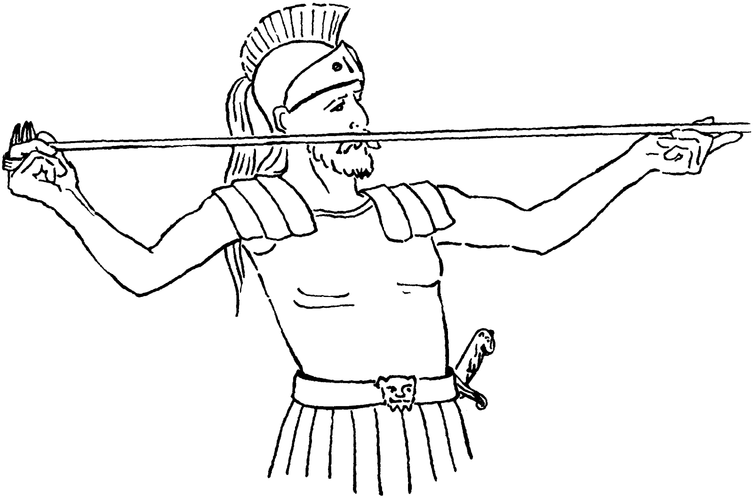

FIG. 26.—Spear-clutch throw.

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* Discussing this and my succeeding paper at the recent meeting of the American Association for the Advancement of Science, in Springfield, Professor Morse questioned the soundness of my theory regarding the primal use of these so-called "bow stringers" or "stretchers." Referring to the great number of such relics which he had examined and sketched, he called attention to the fact that on some of them the prongs were replaced by mere knobs or protuberances. He further argued that such use as I assigned for them, although so important, was nowhere mentioned in classical writings.

In replying, I stated that even this later or bronze form of the objects in question was in the two specimens I had examined so perfectly adapted to the fingers for use in

Yet these early kinds of spear-palms and clutchers, while giving secure grasp and great power in the holding or hurling of heavy weapons, did not greatly increase the distance of their flight. So long as they only were known, there still remained the superiority of the long-armed thrower. But let us suppose that a man holding an extra spear in the hand (point backward) with which he hurled another, happened now and then to catch the butt of the one thrown on the barb of the one held (Fig. 27), he would not fail to find that this gave great additional force to his cast. I conceive that it was thus, or in some like simple way, that it was found expedient to lengthen out, backwardly, the rear- or finger-end of the spear-palm, if the spear-palm had come into vogue before that, and if not, to make an imitation

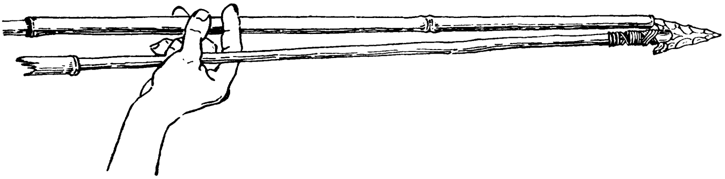

FIG. 27.—Throwing with spear.

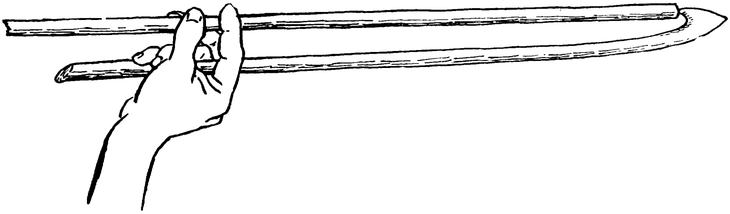

FIG. 28.—Throwing with throw-spear.

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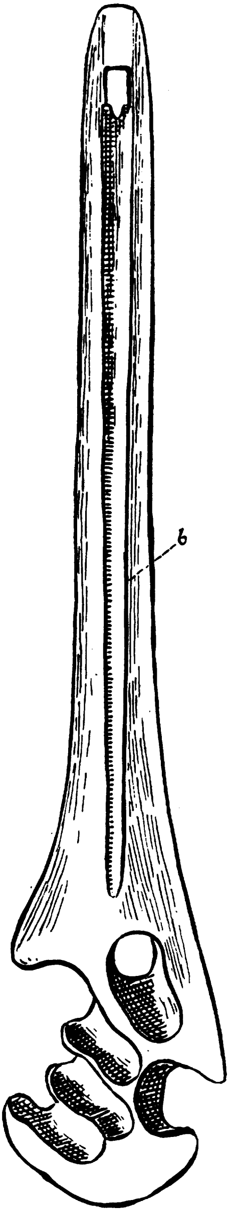
powerfully clutching and casting, say, a spear, that I was inclined still to believe even the knobbed examples he graphically sketched for us could well have served such purpose, or may at least have outlived such use originally in somewhat analogous uses. I would add also that while classical writers do not, indeed, expressly mention, so far as I know, the use of these bronze articles at all, nevertheless some of them, notably Xenophon in his Anabasis, do incidentally refer to straps and other devices for flinging spears, in connection with which these pronged and knobbed rings would have served admirably.

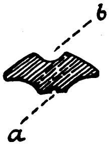
Be all this as it may, the general argument of the paper is not materially affected by this single illustration in it. I acknowledge that the small number of specimens I have studied, though typical, hardly afford basis for more than a suggestion as to their use or derivation, and I am grateful to Professor Morse, therefore, for his words of caution.

throwing-spear, so to call it—a mere spindle or flattened shaft with a barb or hook at the end of it, like, for example, the throwing-sticks of the Australians (Fig. 28). The spear-throwers of the Eskimo (Fig. 29), so instructively classified and described by Professor Mason in his paper on "Throwing-sticks in the National Museum" (Report of the Smithsonian Institution, 1883), are regarded as the most highly developed forms of that apparatus in the world. They certainly are the most elaborate; beautifully shaped to fit exactly the grasp of the throwing hand, and are provided with effective shaft-grooves and butt spurs or catches of ivory or bone. But there are some peculiarities of these throwing-sticks which relate them apparently to an undeveloped form,—quite directly to spear-palms somewhat like those of Santa Barbara and their greatly lengthened out descendant, such as is figured and described by Professor Mason (op. cit.) as having been found in use and collected near Lake Patzcuaro, Mexico, by our well-known, scholarly, and indefatigable writer on anthropology, my friend, Captain John G. Bourke, of the United States Army.

On examining any typical collection of Northwest-coast throwing-sticks, or the illustrations of Professor Mason's paper relative to those of the National Museum, one will be surprised to note how many are marked or grooved down the backs or under sides (Fig. 30). The grooves, thus placed, have no apparent use; were put there, evidently, for some traditional or notional reason. In other words, they would seem to be survivals, for some are mere scratches, and all lead either directly from the finger holes or pits (or else from the side on which these or their substitute clasping notches or pegs occur) to the spur insertion or to beyond, being always painstakingly cut or scratched into or across the base of this hard ivory spur-block.

It is this groove particularly which appears to relate these sticks to one of the earliest forms, the palm-and-finger form (like Fig. 23), for they seem to be survivals of the finger-groove, lengthened out, perhaps, to accommodate the string, which was held noosed to the backwardly bent middle or fore finger and extended to the end of the stick, there to hold the butt of the spear or catch thereof until a bone finger (artificial finger-nail, as it were) was inserted, after which, as was fit in savage use, the groove was kept as a channel from the finger end to this extra end or nail, as a





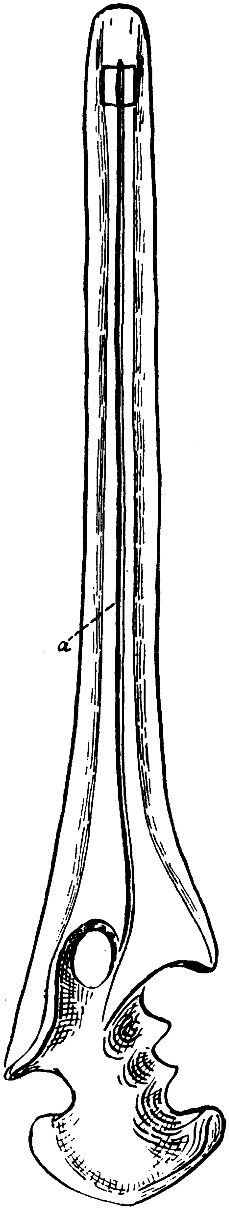


Fig. 29.—Front of Eskimo spear-thrower, showing shaft-groove and spur (see also section).

Fig. 30.—Reverse of Eskimo spear-thrower, showing back groove (*a* in figure and section).

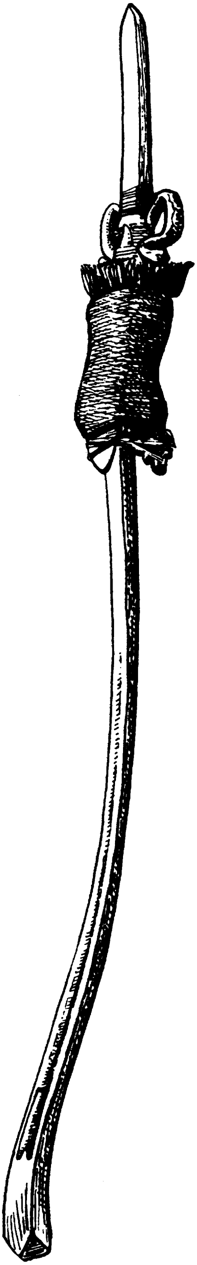


Fig. 31.—Restoration of Cliff-dweller throwing-stick or atlatl.

"way trail," so to say, through which the strength of the forefinger might reach the spear-butt or catch. I would like to refer to some examples of this groove as having probably been transferred in turn even from the throwing-stick to later forms, when these displaced its supremacy in use, as may be seen on certain bow-arms of the northwest region, the bellies of which are quite as uselessly grooved from grip, to horn or nock.

The element next higher in the development of the dart-flinger is not present, however, to any great extent, in the Eskimo forms, but it is to be found very decidedly exemplified in the throwing-slat or atlatl, quite independently identified by Professor Mason and myself in the remarkable Cliff-dweller collection I have before referred to.

Through the courtesy of my friend Mr Stewart Culin, Director of the Archeological Department of the University of Pennsylvania, I have been enabled to study out experimentally the original form of this interesting flinging-slat or -stick, and to reproduce it in its original condition, accurately and in working form. This little apparatus (Fig. 31) is made from a very slender and flexible sapling, of light and springy but hard wood, such as the Cliff-dweller bows were made of, the half or one arm of the more finished sort of which it almost exactly resembles—that is, the small handle is straight or slightly upturned from the ingeniously attached, spectacle-like finger loops or rings of hide, and thence toward the spur end it curves first downward, then rather sharply upward to the groove, which is short and shallow, and to the terminal spur-sink, which is only an inch or two long and is relatively deep. Thence to the end, a couple of inches more, the stick is curved down again so as to throw up the spur or catch and the little groove at the end of which it is cut; and thus the whole in profile and upside down resembles the arm of a Cupid's bow, save that the end or "horn" is thick.

Just above the handle and finger-loops is a heavy binding, first of sinew, then of yucca fiber, lastly of brown yarn, which at the outer end firmly seizes to the rounded (or under and back) side of the implement a fragment of beautiful black slag or limonite—the blood-clot of giants slain in Creation time with lightning of the gods of war, according to Zuñi lore. On the opposite or flat, upper, and front side, also at the outer end of the bindings or packings, a beautifully ground and polished chalcedony knife-blade (the tip only of which protrudes) is bound on and probably served to divide the feathers, or as the "father of lightning" (to increase which it was doubtless ground at night), precisely as the lightning knives of the Zuñis are on their badges of war. Finally a little tusk of the wildcat is inserted into the packing on the same side, its protuberant point laid close against the finger loop, strap, or fastening, so as to hold it from slipping. I find that originally feather-work was whipped into the surface of the packing near either end—of red, yellow, and blue

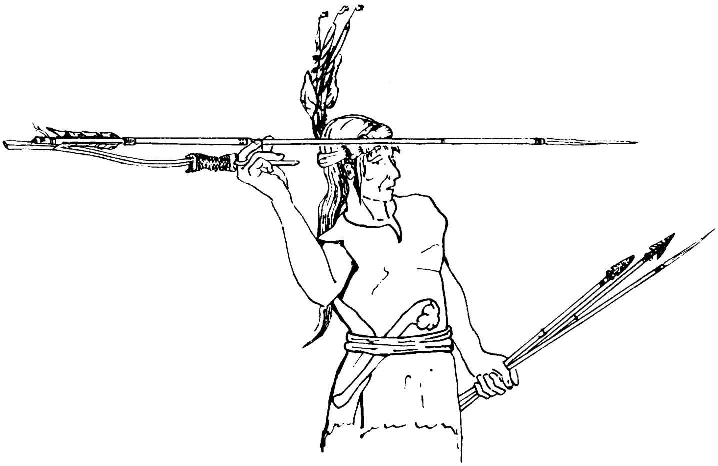


FIG. 32.—Cliff-dweller atlatl or throwing-stick in use.

plumage, probably taken from the jay and the red-headed woodpecker of the south or from humming-birds. All this was both fetishistic (the life portion of the flinger) and to brace the knuckles so that the spear could be easily held high when flung. Thus the shaft of the dart did not lie along the upper face, as in other and long-grooved examples, but merely touched the counter-sink near the spur or catch at its end. As the result of this method of release and of the curved and flexible style of the flinging-stick, the spear or dart could be sped with a spring, which added so greatly to its force that with my reproduction of the cliff specimen I can throw the harpoon twice as far (Fig. 32) as with my Eskimo specimen, with less trajectory and hence more accurately.

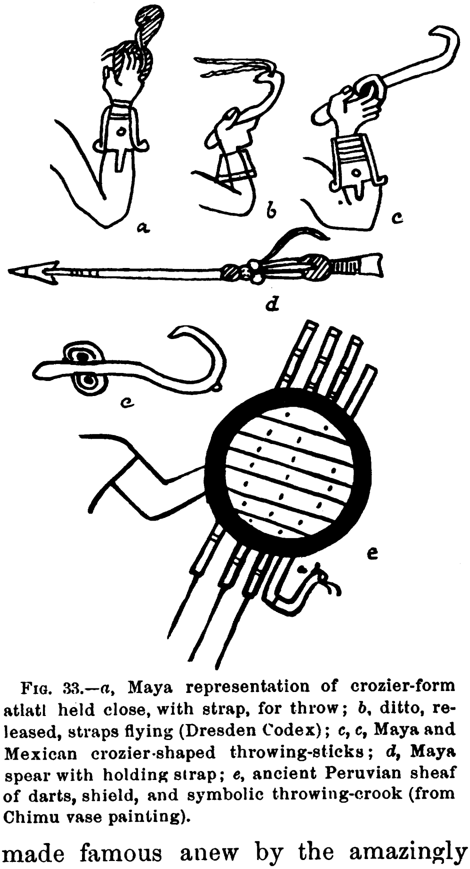


FIG. 33.—*a*, Maya representation of crozier-form atlatl held close, with strap, for throw; *b*, ditto, released, straps flying (Dresden Codex); *c*, *c*, Maya and Mexican crozier-shaped throwing-sticks; *d*, Maya spear with holding strap; *e*, ancient Peruvian sheaf of darts, shield, and symbolic throwing-crook (from Chimu vase painting).

Among a people armed with such effective flingers, I do not wonder that their use survived that of the bow, even away from the appropriate habitat of the spear-thrower—the water side; nor need one wonder that the famous atlatl of the ancient Mexicans, made famous anew by the amazingly convincing and beautiful study of it Mrs Zelia Nutall has given us in the first volume of the Archeological and Ethnological Papers of the Peabody Museum (Harvard University, 1891), and which atlatl is, I belive, the lineal descendant of this one of the Cliff-dwellers, feather-work, fetishistic element, and all; nor that it should also have been even more highly valued for special purposes by the Aztecs than was the bow, for in its many southern forms, as figured by Mrs Nutall, are to be found still higher developments. I refer especially to the crozier-shape ones and to those "with straps" (Fig. 33, *a*, *b*), recalling Fray Diego de Landa's most significant description of the Maya forms seen by him in the sixteenth century.

Now, the crozier-shape or bent form of the spear-flinger (Fig. 33, *cc*, *e*) was, as my experiments have indicated, a veritable combination of the bow and the spear-thrower. In it the spring of the bow already appears. It is simply a stringless bow, used backward, while in the still more elaborated form of it, that of the Mayas, the string also appears, only it was loose at one end (Fig. 33, *a*, *b*) or else attached to the spear-shaft itself (Fig. 33, *d*), as shown by the plates in the Dresden Codex (which has opportunely been sent me within the last two weeks by that generous patron of anthropologic research, M. le Duc Loubat). Were I uncertain of the meaning of these forms I might be reassured by certain evidences furnished by the Zuñi. The Zuñi still have traditional knowledge of the use of the spear-thrower and its appropriate hoop or net shield by their cliff-dwelling ancestry;

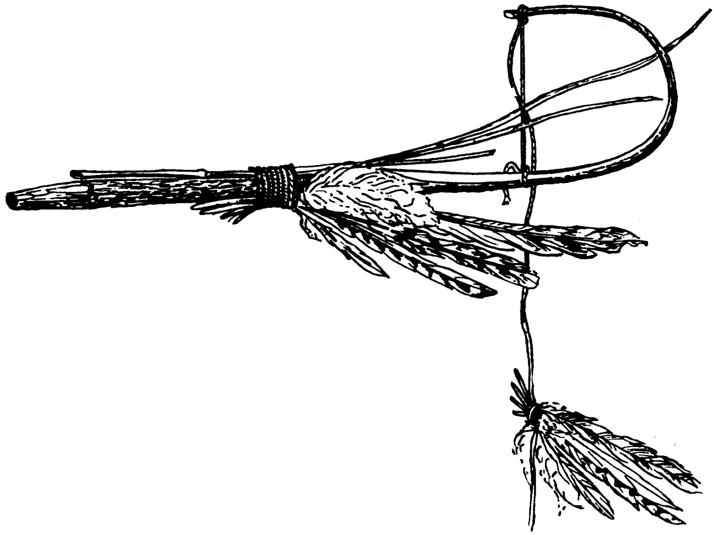


Fig. 34.—Zuñi plumed prayer-stick of war sacrifice, or "Bearer of the reed of war."

and the truthfulness of their vague traditions is substantiated by certain survivals among them. One of these, as exemplified in certain spear and ring games, I shall refer to in the following part of this paper. The presently significant one is apparent in their little crooked or crozier-shape prayer wands or staffs. Some of these are actual staffs in miniature, and symbolize the prayer journey and a number of other things; but the warrior and hunter symbol and sacrifice of this shape, differs from these in being supplied with a holding string. It consists of a split twig about a foot long, the upper end of which is bent far over, like the head of a shepherd's crook (Fig. 34), and tied at right angles to the main part of the shaft with a taut string, on the middle of which is a double knot or a dab or two of black paint.

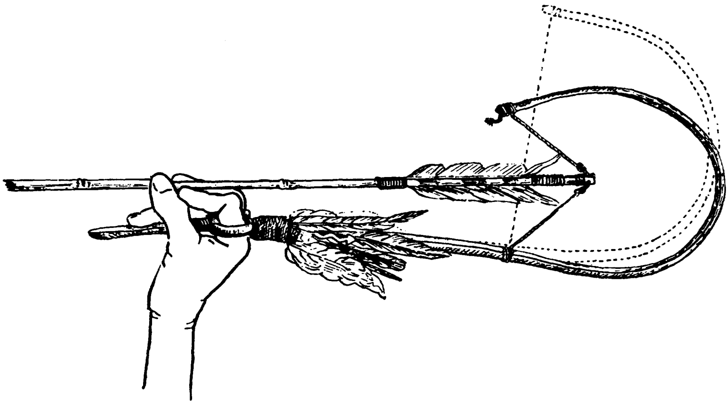


Fig. 35 —Restoration of ancient stringed spear-crook or throwing-bow (from Zuñi prayer-stick of war).

It is plumed on the handle portion or near the base, and attached to it inside, so as to lie along it and against the string at the "knot" or paint dab, is a sprout or stem of cane or reed-grass. If this little "carrier of the cane" or "war-staff" be but enlarged or restored (as I have experimentally restored it) and used with a notched spear-dart like those of the Dresden Codex, with or without straps, and if then the missile be pressed back against the string and held with fingers (or by its strap) until released with a fling, the rebound of the string, as well as the spring of the flinging-staff, adds treble velocity to it. And it seems to me that the steps are few and short from this already strung but reversed flinging-bow (Fig. 35) to the bow of archery.

That such steps were actually taken, not in one land and by one people alone, but in many lands and by many peoples (and from differing forms and styles of throwers to differing developments of the bow), can, I think, already be shown. In the first place, the Zuñi name for the bow is significant. It is *pi′-‘hlan-ne*, from *pi′*, "a string" or "stringed" (emphatic form); *‘hlam*, "a slat," "stave," or "staff," and *a′-ne*, "to go," or *a′n-a-ne*, "go-thing"—that is, "a stringed go-staff" or "stringed *go*-slat." "To shoot" (with an arrow) or "to hunt" is *‘hala′-ta*—that is, "slat-direct" or "staff-aim"—whereas the name for an arrow is *sho′-o-le* ("cane" or "reed"), and is not, it will be seen, referred to in this etymology. Again, to hit or pierce with an arrow is *‘hlat-k‘u*, from *‘hla′m*, "a staff" or "slat," and *t′e-k‘u*, "to stick into"—that is, "to slat-stick" or "slat pierce," in the sense of piercing or sticking into from or by means of, not with, the slat. Now, all these terms, especially the latter two, were formulated, I take it, from use of the throwing- or flinging-staff, not from use of the bow in its

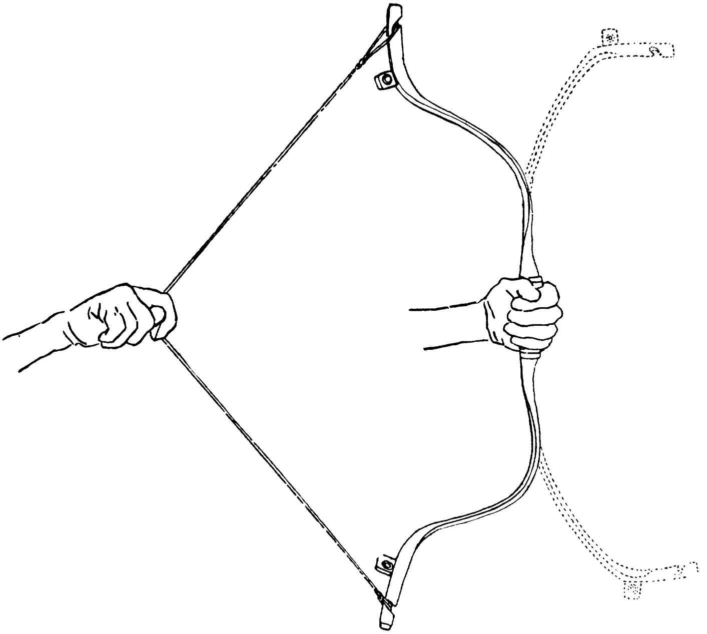


FIG. 36.—The "Tartar bow," as drawn, released, and reversed when braced with slack string.

later form; and they would indicate that with the Zuñi ancestry, at least, the throwing-stick both antedated and gave rise to their later present form of bow. Of this there is far more additional evidence than I can offer here. Nor can I enter into the intensely interesting results of my experiment study of Mexican and Mayan forms of the throwing-stick, all indicating even more strongly the same thing, and indicating also the directness of derivation from our own great southwest, of art elements, at least, in these old cultures of the south. I must, on the contrary, turn a few moments to other lands.

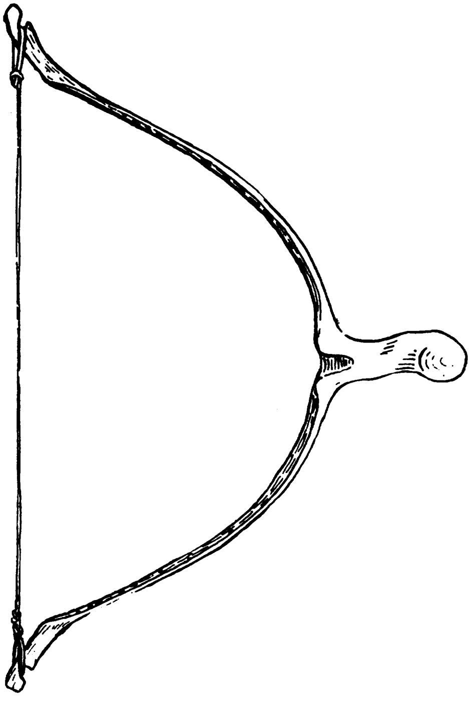


Fig. 37.—Primitive crotch-bow, wide antlers.

In old world countries, language tells much the same story in, for example, Chinese and Korean terms and characters, according to Mr Culin's profound studies of these peoples and their languages, and in the Arabic,—of which that brilliant and universal scholar, Dr Talcott Williams, tells me archery terms are apparently quite as dissociated in derivation from an original use of the bow with the arrow as are those I have above analyzed.

When talking on this subject with my lamented friend, the artist, Thomas Hovenden, who went to his noble and heroic death but a few days ago, he did not at first understand and quite believe in my theory, but pushed a canvas toward me, and handing me a charcoal stick, bade me draw the form of thrower I then thought was the connecting link between flinger and bow. I drew one—a long, slender twig, with a fork at the end, and a string attached to the crotch, both for catching the spear and for bending the stick to give it spring when loosed. He looked astounded for a moment, then delighted. "Do you know," said he, "that as a boy I played with such a sling-stick as that, as other boys commonly did when bird hunting on the Irish marshes;" and in the morning he made me one. It was my hypothetical connecting link between spear-flinger and bow.

Dr Williams informs me also that when he was a boy the young Indians of central New York used some such apparatus, half toy, half weapon, and that his father once made one for him. You are all familiar with the dart-springing stick, which is stuck in the ground and while held by one hand is pulled back by the other to fling the dart. Certainly every one is acquainted with the "slapjack," destroyer of so many window-panes in school-rooms and on city streets. You approvingly remember also, I hope, what I have said on an earlier page, of toys; but I wish to explain for a moment the development of a throwing-crotch resembling these things, in a part of the world where its study serves to ex-

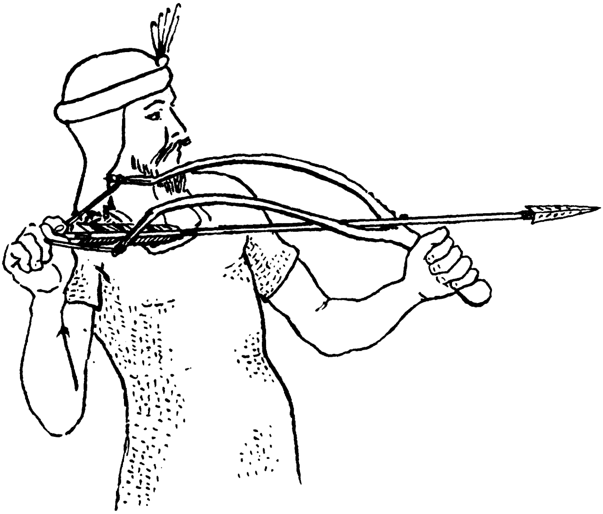


Fig. 38.—Mode of bracing and releasing bow-crotch.

plain more than merely the origin of its appropriate form of the bow. I refer to the vast area of the so-called "Scythian" or "Tartar bow." Any one who examines one of these extraordinary bows, and especially who notes the manner of its use, will not find much difficulty, it seems to me, in tracing it back to what appears to have been its ancestral form in a simple forked twig or flinging-crotch, the steps are so obvious and few.

The Tartar bow (Fig. 36) is a built-up bow, excessively flexed, not toward the belly, as are bows usually, but toward the back, its ends or horns being still more backwardly flexed, so that they even approach each other when the bow is slacked. The string-nocks are deep and slanting, and at the base of each horn or ear is attached, on the belly side, a bone or other hard block, chiefly to catch or slip the string when rebounding, but pierced transversely in some specimens. Through these blocks the ends of the string used sometimes to be passed from one side before being noosed to the nocks or else it was knotted one-sidedly to the nock of the upper arm. Thus when the bow was drawn, not only were the arms reflexed more than twice as far by a pull of but the same distance to the rear of the grip or bow-hand than they would be on the ordinary bow, but the string pulled more to one side than the other, so that the curious overhand release sometimes observed among Tartar, and, I am told, some other Mongolian tribes, was not only facilitated, but in these cases was rendered inevitable. Thus an arrow was half shot, half flung, or

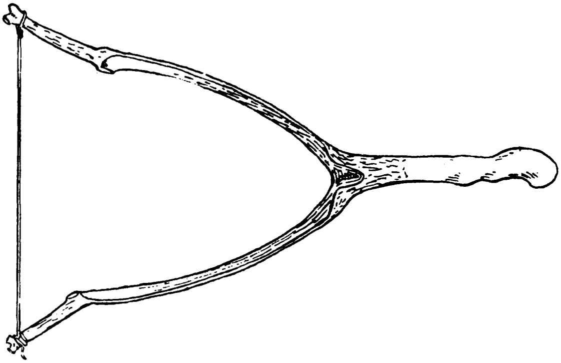


FIG. 39.—Primitive bow-crotch, narrow antlers.

cast from such a bow, and it is this which makes the thumb-ring pull and the overhand release natural and which challenges our attention ; for the motion of the release (Fig. 36), no less than the form of the bow, seem both to have been directly derived from a wide-antlered, two-hand dart-flinging crotch (Fig. 37)—half slinger, half bow—which probably suggested a still wider-armed, spliced and haftless crotch or bow, and thus almost immediately preceded it in development. With such a crotch, if stringed between the two antlers or branches and grasped in the left hand by the handle at their base or juncture, while with the thumb of the right hand the string was drawn back—the dart meantime being held thereto with the fingers of the same hand and thus braced for release (Fig. 38)—one can see that with a sharp fling the dart would be discharged over the crotch and the string fly over the bow-hand, much as it does in the Tartar bow-release, so to call it. This form in turn is but an improvement on the one less spread and depending on both outward and forward release-spring in its antlers (Fig. 39) ; and this, finally, is but little better than one in which the spring of its still less separated branches was forward alone, and was its sole advantage over the long-branched and flexible but one-handed throwing-crotch (Fig 40, *a*), recalling in some ways the unrelated Celtic form my friend Hovenden made, and the primal short-branched sling-crotch (Fig. 40, *b*) in which it would seem was the germ of this peculiar sort of built-up and compound ancestor of the Mongolian bow.

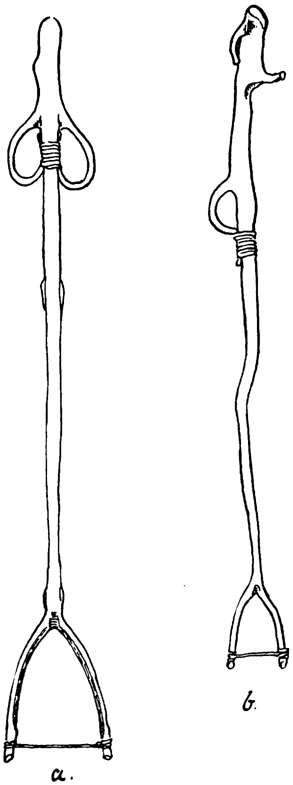


Fig. 40.—Dart-flinger crotches ; *a*, developed form ; *b*, early form.

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